WHAT IS CLAIMED IS:

1. A system for determining at least one parameter of a fluid in a tubular string, the system comprising:

a pressure pulse generator transmitting a pressure pulse through the fluid in the tubular string; and

at least a first set of sensors utilized in determining a velocity of the pressure pulse transmitted through the fluid.

2. The system according to claim 1, wherein the first set of sensors is utilized in determining a velocity of the pressure pulse reflected back through the fluid.

3. The system according to claim 1, wherein at least one of the sensors is a fiber optical sensor.

4. The system according to claim 1, wherein an open end of the tubular string reflects the pressure pulse back through the fluid to the first set of sensors.

5. The system according to claim 1, wherein an impedance mismatch reflects the pressure pulse back through the fluid to the first set of sensors.

6. The system according to claim 1, further comprising a second set of sensors sensing the transmitted pressure pulse.

7. The system according to claim 6, wherein the second set of sensors is utilized in determining a velocity of the pressure pulse reflected back through the fluid.

8. The system according to claim 6, wherein the first set of sensors is positioned at a first portion of the tubular string, and wherein the second set of sensors is positioned at a second portion of the tubular string spaced apart from the first portion.

9. The system according to claim 6, wherein the first set of sensors is positioned in a first wellbore, and wherein the second set of sensors is positioned in a second wellbore which intersects the first wellbore.

10. The system according to claim 1, wherein the first set of sensors is positioned in an external coating on the tubular string, the coating amplifying strain due to the pressure pulse in the tubular string.

11. The system according to claim 1, wherein the fluid is a combination of at least first and second components which are substantially stratified within the tubular string, and wherein the first set of sensors is distributed circumferentially about the tubular string, so that a first portion of the sensors senses the pressure pulse transmitted through the first component, and a second portion of the sensors senses the pressure pulse transmitted through the second component.

12. The system according to claim 11, wherein each sensor of the first set of sensors is connected to a single fiber optic line.

13. The system according to claim 11, wherein each sensor of the first set of sensors is formed on a single fiber optic line.

14. A method of determining at least one parameter of a fluid in a tubular string, the method comprising the steps of:

transmitting a pressure pulse through the fluid in the tubular string, thereby causing the pressure pulse to reflect back through the fluid;

determining a first velocity of the transmitted pressure pulse; and

determining a second velocity of the reflected pressure pulse.

15. The method according to claim 14, further comprising the step of calculating an average velocity of the fluid in the tubular string.

16. The method according to claim 15, wherein the calculating step is performed by a method including the steps of determining a difference between the first and second velocities, and dividing the difference by two.

17. The method according to claim 14, further comprising the step of calculating an average acoustic speed of sound in the fluid in the tubular string.

18. The method according to claim 17, wherein the average acoustic speed calculating step is performed by a method including the steps of determining a sum of the first and second velocities, and dividing the sum by two.

19. The method according to claim 14, wherein each of the determining steps further comprises sensing the pressure pulse via a first set of sensors spaced apart a first predetermined distance along the tubular string.

20. The method according to claim 19, wherein each of the determining steps further comprises dividing the first predetermined distance by a difference between times of arrival of the pressure pulse at each of the sensors of the first set of sensors.

21. The method according to claim 19, further comprising the step of determining times of arrival of the pressure pulse by cross-correlating signals produced by sensors of the first set of sensors in response to the pressure pulse.

22. The method according to claim 19, further comprising the step of determining times of arrival of the pressure pulse by determining leading edges of signals produced by sensors of the first set of sensors in response to the pressure pulse.

23. The method according to claim 19, wherein each sensor of the first set of sensors is a fiber optic sensor.

24. The method according to claim 19, wherein each sensor of the first set of sensors is a hydrophone.

25. The method according to claim 19, wherein each sensor of the first set of sensors is a geophone.

26. The method according to claim 19, wherein each sensor of the first set of sensors is a strain sensor.

27. The method according to claim 19, wherein each sensor of the first set of sensors is a pressure sensor.

28. The method according to claim 19, wherein each sensor of the first set of sensors is an accelerometer.

29. The method according to claim 19, wherein the first set of sensors is included in a Raman scattering distributed temperature sensing system.

30. The method according to claim 19, wherein the first set of sensors is included in a Brillouin distributed strain sensing system.

31. The method according to claim 19, wherein each sensor of the first set of sensors is a fiber Bragg grating temperature sensor.

32. The method according to claim 19, wherein each sensor of the first set of sensors includes a chemical composition which responds to the pressure pulse.

33. The method according to claim 19, wherein at least one sensor of the first set of sensors senses a parameter different from a parameter sensed by another sensor of the first set of sensors.

34. The method according to claim 19, further comprising the step of connecting each sensor of the first set of sensors to a single fiber optic line.

35. The method according to claim 34, further comprising the step of transmitting an optical signal through the fiber optic line to each sensor of the first set of sensors.

36. The method according to claim 35, wherein the light transmitting step further comprises multiplexing the optical signal, thereby permitting a response of each of the sensors of the first set of sensors to be demultiplexed in an optical signal receiver.

37. The method according to claim 36, wherein the multiplexing step further comprises wavelength division multiplexing the optical signal.

38. The method according to claim 36, wherein the multiplexing step further comprises time division multiplexing the optical signal.

39. The method according to claim 19, wherein each of the determining steps further comprises sensing the pressure pulse via a second set of sensors spaced apart a second predetermined distance along the tubular string.

40. The method according to claim 39, wherein each of the determining steps further comprises dividing the first predetermined distance by a difference between times of arrival of the pressure pulse at each sensor of the first set of sensors, and dividing the second predetermined distance by a difference between times of arrival of the pressure pulse at each sensor of the second set of sensors.

41. The method according to claim 39, further comprising the steps of determining the times of arrival of the pressure pulse at the first set of sensors by cross-correlating signals produced by the sensors of the first set of sensors in response to the pressure pulse, and determining the times of arrival of the

pressure pulse at the second set of sensors by cross-correlating signals produced by the sensors of the second set of sensors in response to the pressure pulse.

42. The method according to claim 39, further comprising the steps of determining the times of arrival of the pressure pulse at the first set of sensors by determining leading edges of signals produced by the sensors of the first set of sensors in response to the pressure pulse, and determining the times of arrival of the pressure pulse at the second set of sensors by determining leading edges of signals produced by the sensors of the second set of sensors in response to the pressure pulse.

43. The method according to claim 39, wherein the first velocity determining step further comprises determining the first velocity at each of the first and second sets of sensors, and wherein the second velocity determining step further comprises determining the second velocity at each of the first and second sets of sensors.

44. The method according to claim 43, further comprising the steps of positioning the first set of sensors at a first portion of the tubular string, and positioning the second set of sensors at a second portion of the tubular string.

45. The method according to claim 44, further comprising the step of calculating an average velocity of the fluid in each of the first and second portions of the tubular string by determining a difference between the first and second velocities at each of the first and second sets of sensors, and dividing each difference by two.

46. The method according to claim 45, further comprising the step of calculating a difference between the average velocity of the fluid in the first portion of the tubular string and the average velocity of the fluid in the second portion of the tubular string.

47. The method according to claim 46, further comprising the step of multiplying the difference between the average velocity of the fluid in each of the first and second portions of the tubular string by a cross-sectional area of the tubular string, thereby determining a differential volumetric flow rate of the fluid between the first and second sets of sensors.

48. The method according to claim 47, wherein in the differential volumetric flow rate determining step, the differential volumetric flow rate is a rate at which the fluid is added to the tubular string between the first and second sets of sensors.

49. The method according to claim 47, wherein in the differential volumetric flow rate determining step, the differential volumetric flow rate is a rate at which the fluid is discharged from the tubular string between the first and second sets of sensors.

50. The method according to claim 44, further comprising the step of calculating an average acoustic speed of sound in the fluid in each of the first and second portions of the tubular string by determining a sum of the first and second velocities at each of the first and second sets of sensors, and dividing each sum by two.

51. The method according to claim 50, further comprising the step of calculating a difference between the average speed of sound in the fluid in the first portion of the tubular string and the average speed of sound in the fluid in the second portion of the tubular string.

52. The method according to claim 51, wherein the fluid is a combination of at least first and second components, each of the first and second components having a known density, and further comprising the step of calculating a volume fraction of each of the first and second components of the fluid in each of the first and second portions of the tubular string from the known

densities of the first and second components and the average speed of sound in the first and second portions of the tubular string.

53. The method according to claim 52, further comprising the steps of adding fluid to the tubular string between the first and second sets of sensors, and calculating a difference between the volume fractions of each of the first and second components of the fluid in each of the first and second portions of the tubular string to thereby determine a volume fraction of each of the first and second components of the fluid added to the tubular string between the first and second sets of sensors.

54. The method according to claim 39, further comprising the step of positioning the first and second sets of sensors in a single wellbore.

55. The method according to claim 39, further comprising the steps of positioning the first set of sensors in a first wellbore, and positioning the second set of sensors in a second wellbore which intersects the first wellbore.

56. The method according to claim 39, wherein each sensor of the first and second sets of sensors is a fiber optic sensor.

57. The method according to claim 39, wherein each sensor of the first and second sets of sensors is a hydrophone.

58. The method according to claim 39, wherein each sensor of the first and second sets of sensors is a geophone.

59. The method according to claim 39, wherein each sensor of the first and second sets of sensors is a strain sensor.

60. The method according to claim 39, wherein each sensor of the first and second sets of sensors is a pressure sensor.

61. The method according to claim 39, wherein each sensor of the first and second sets of sensors is an accelerometer.

62. The method according to claim 39, wherein the first and second sets of sensors are included in a Raman scattering distributed temperature sensing system.

63. The method according to claim 39, wherein the first and second sets of sensors are included in a Brillouin distributed strain sensing system.

64. The method according to claim 39, wherein each sensor of the first and second sets of sensors is a fiber Bragg grating temperature sensor.

65. The method according to claim 39, wherein each sensor of the first and second sets of sensors includes a chemical composition which responds to the pressure pulse.

66. The method according to claim 39, wherein at least one sensor of the first set of sensors senses a parameter different from a parameter sensed by another sensor of the first set of sensors.

67. The method according to claim 39, wherein at least one sensor of the second set of sensors senses a parameter different from a parameter sensed by another sensor of the second set of sensors.

68. The method according to claim 39, further comprising the step of connecting each sensor of the first and second sets of sensors to a single fiber optic line.

69. The method according to claim 68, further comprising the step of transmitting an optical signal through the fiber optic line to each sensor of the first and second sets of sensors.

70. The method according to claim 69, wherein the light transmitting step further comprises multiplexing the optical signal, thereby permitting a response of each of the sensors of the first and second sets of sensors to be demultiplexed in an optical signal receiver.

71. The method according to claim 70, wherein the multiplexing step further comprises wavelength division multiplexing the optical signal.

72. The method according to claim 70, wherein the multiplexing step further comprises time division multiplexing the optical signal.

73. The method according to claim 14, wherein the reflecting step further comprises reflecting the pressure pulse off of a closed end of the tubular string.

74. The method according to claim 14, wherein the reflecting step further comprises reflecting the pressure pulse off of an open end of the tubular string.

75. The method according to claim 14, wherein each of the determining steps further comprises sensing the pressure pulse using at least one strain

sensor positioned in an external coating on the tubular string, the coating amplifying strain due to the pressure pulse in the tubular string.

76. The method according to claim 14, wherein each of the determining steps further comprises sensing the pressure pulse using multiple sensors distributed circumferentially about the tubular string.

77. The method according to claim 76, further comprising the step of connecting each of the sensors to a single fiber optic line.

78. The method according to claim 76, further comprising the step of forming each of the sensors on a single fiber optic line.

79. The method according to claim 78, wherein the forming step further comprises forming each of the sensors as a grating pattern on the fiber optic line.

80. The method according to claim 76, wherein the fluid is stratified within the tubular string, so that at least first and second components of the fluid are substantially separated in the tubular string, and wherein each of the determining steps further comprises determining each of the first and second velocities in the first component using a first set of the sensors, and determining

each of the first and second velocities in the second component using a second set of the sensors.

81. The method according to claim 14, wherein the transmitting step further comprises transmitting the pressure pulse as a momentary increase in pressure in the tubular string.

82. The method according to claim 14, wherein the transmitting step further comprises transmitting the pressure pulse as a momentary decrease in pressure in the tubular string.

83. The method according to claim 14, further comprising the step of sensing a temperature of the fluid in the tubular string.

84. The method according to claim 83, further comprising the steps of calculating an average density of the fluid in the tubular string using the first and second velocities, and correcting the average density using the sensed temperature of the fluid.

85. The method according to claim 83, wherein the temperature sensing step is performed by transmitting light through a fiber optic line extending along the tubular string.

86. The method according to claim 85, wherein the first and second velocities determining steps further comprise sensing the pressure pulse using at least two sensors connected to the fiber optic line.

87. The method according to claim 14, further comprising the step of sensing ambient pressure of the fluid in the tubular string.

88. The method according to claim 87, wherein the ambient pressure sensing step is performed by transmitting light through a fiber optic line extending along the tubular string.

89. The method according to claim 88, wherein the first and second velocities determining steps further comprise sensing the pressure pulse using at least two sensors connected to the fiber optic line.

90. The method according to claim 14, wherein the transmitting step further comprises connecting a pressure pulse generator to the tubular string at a surface of the earth.

91. The method according to claim 14, wherein the transmitting step further comprises positioning a pressure pulse generator in a wellbore with the tubular string.

92. The method according to claim 14, wherein the transmitting step further comprises positioning a pressure pulse generator in a branch wellbore.